

## MPS21 – Precalculus Exam 3 Review Sheet

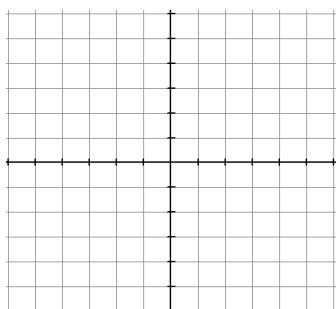
### Topics:

- odd and even functions
- transformations of functions: translations, reflecting over  $x$ -axis and  $y$ -axis, shrinking/stretching
- operations with functions (adding/subtracting/multiplying/dividing) algebraically and graphically
- composition of functions
- finding the inverse of a function algebraically and graphically
- determining whether a function has an inverse function (horizontal line test/one-to-one functions)

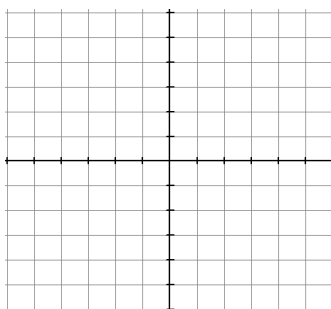
### Practice Problems:

1. (i) Sketch the graph of each of the following functions.  
 (ii) Is the function one-to-one? Why or why not?  
 (iii) If the function is one-to-one, find the equation of the inverse and sketch its graph on the same axes.

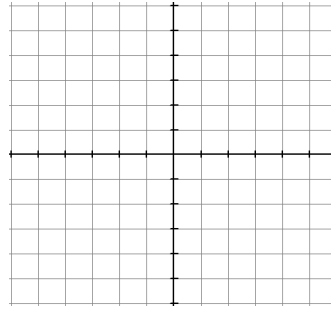
(a)  $f(x) = 2x - 1$



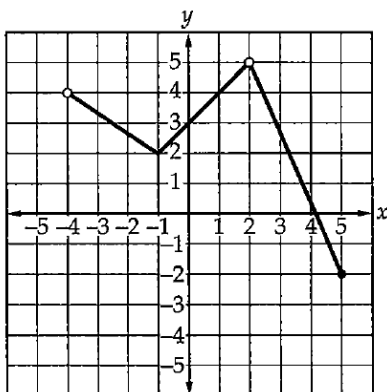
(b)  $g(x) = x^2 - 1, x \geq 0$



(c)  $h(x) = \sqrt{x} - 2$



2. Given the graphs of  $f(x)$  and  $g(x)$ , draw the graph of  $h(x) = (f + g)(x)$  on the same set of axes.



3. What single transformation changes the graph of a function to the graph of its inverse?

4. For each of the following functions, determine if the function is even, odd, or neither. Justify your answer algebraically.

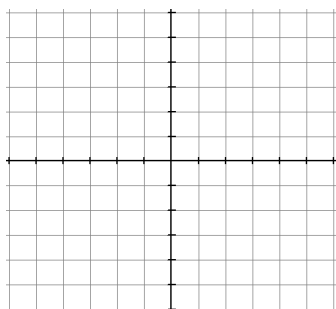
(a)  $f(x) = x^4 + 3x^3 - 2x$

(b)  $g(x) = \sqrt{x+2}$

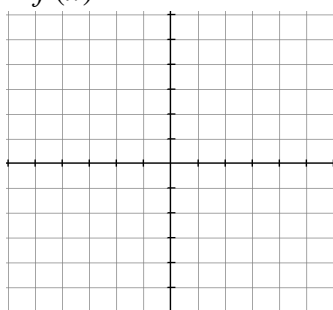
(c)  $h(x) = 2x$

(d)  $k(x) = x^4 - x^2$

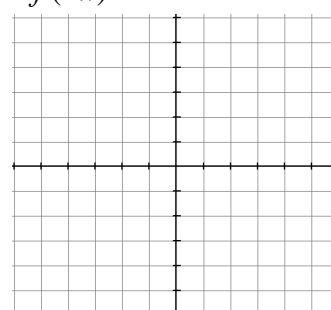
5. Given the graph of  $f(x)$ , sketch the graphs of the indicated functions.



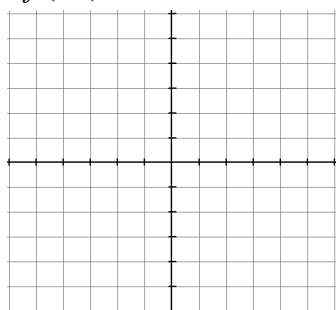
(a)  $-f(x)$



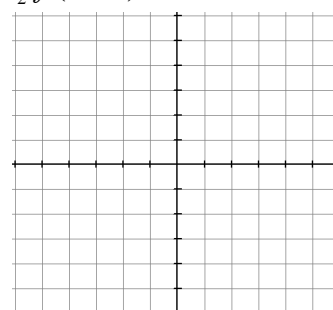
(b)  $f(-x)$



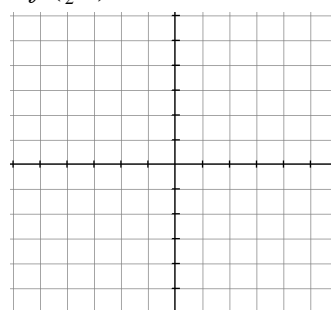
(c)  $f(2x) + 1$



(d)  $\frac{1}{2}f(x-2)$



(e)  $f(\frac{1}{2}x) - 2$



6. If the point  $(2, 5)$  is on the graph of  $y = f(x)$ , state the coordinates of the corresponding point on the graph of (a)  $y = -2f(x+12) - 7$  \* (b)  $y = -5f(7 - \frac{1}{4}x) + 3$

7. Given  $f(x) = 3x - 4$  and  $g(x) = x + 2$ , find, in simplest form:

(a)  $(f \circ g)(x)$  (b)  $(g \circ f)(x)$

(c)  $(f \circ f)(x)$  (d)  $(g \circ g)(x)$

(e)  $(f - g)(x)$  (f)  $(f \cdot g)(x)$

(g)  $(f/g)(x)$  (h)  $(f \circ f^{-1})(x)$

8. Show algebraically that  $f(x) = \frac{x^4 - 1}{2}$  and  $g(x) = \sqrt[4]{2x + 1}$  are inverses of each other.

9. Write the equation of each graph. What is the parent function?